

Claims

1 1. An apparatus for taking absorbance-based chemical measurements comprising a
2 reagent-based optical chemical sensor comprising an analyte-selective reagent, means for
3 renewing said reagent, means for allowing said reagent to reach equilibrium with an analyte
4 and, means for calculating the sensor response from a ratio of the absorbance of said reagent
5 determined relative to a blank solution.

1 2. The apparatus of claim 1, wherein said analyte-selective reagent is colorimetric.

1 3. The apparatus of claim 1, wherein said analyte-selective reagent is ^{fluorescent} fluorescent.

1 4. The apparatus of claim 1, wherein said means for renewing said reagent comprises
2 a pump and at least one valve.

1 5. The apparatus of claim 1, wherein said means for renewing said reagent is selected
2 from a group consisting of at least one peristaltic pump, at least one syringe pump, at least
3 one positive displacement pump, at least one solenoid pump and valve and at least one pinch
4 valve.

1 6. The apparatus of claim 1, wherein said means for renewing said reagent comprises
2 a solenoid pump and valve.

1 7. The apparatus of claim 1, wherein said means for calculating the sensor response
2 includes the equation $A_R = A_{\lambda 1} / A_{\lambda 2}$, where A_R is said sensor response, $A_{\lambda 1}$ is absorbance at $\lambda 1$
3 and $A_{\lambda 2}$ is absorbance at $\lambda 2$ and, wherein $A_{\lambda 1}$ and $A_{\lambda 2}$ are determined by

$$A_{\lambda} = -\log \frac{I_{\lambda}}{I_{\lambda 0}}$$

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1 8. The apparatus of claim 1, wherein said reagent-based optical chemical sensor is a
2 Submersible Autonomous Moored Instrument for CO₂.

1 9. The apparatus of claim 8, wherein said analyte-selective reagent is bromothymol
2 blue.

1 10. The apparatus of claim 8, wherein said Submersible Autonomous Moored
2 Instrument for CO₂ comprises a spectrograph filter.

1 11. The apparatus of claim 8, wherein said Submersible Autonomous Moored
2 Instrument for CO₂ comprises a GaP photodiode.

1 12. The apparatus of claim 8, wherein said means for calculating the sensor response
2 includes the equation $A_R = A_{\lambda 1} / A_{\lambda 2}$, where A_R is said sensor response, $A_{\lambda 1}$ is absorbance at $\lambda 1$
3 and $A_{\lambda 2}$ is absorbance at $\lambda 2$ and, wherein $A_{\lambda 1}$ and $A_{\lambda 2}$ are determined by

$$A_{\lambda} = -\log \frac{I_{\lambda}}{I_{\lambda 0}}$$

1 13. A method of taking absorbance-based chemical measurements comprising the
2 steps of:

- 3 a) utilizing a reagent-based optical chemical sensor comprising an analyte-
4 selective reagent;
5 b) renewing said analyte-selective reagent;
6 c) equilibrating said renewed analyte-selective reagent to said analyte; and
7 d) calculating the sensor response from a ratio of the absorbance of said analyte-
8 selective reagent determined relative to a blank solution.

1 14. The method of claim 13, wherein said analyte-selective reagent is colorimetric.

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1 15. The method of claim 13, wherein said analyte-selective reagent is fluorescent.

1 16. The method of claim 13, wherein said reagent is renewed by a pump and at least
2 one valve.

1 17. The method of claim 16, wherein said pump and at least one valve are selected
2 from a group consisting of at least one peristaltic pump, at least one syringe pump, at least
3 one positive displacement pump, at least one solenoid pump and valve and at least one pinch
4 valve.

1 18. The method of claim 13, wherein said reagent is renewed by a solenoid pump and
2 valve.

1 19. The method of claim 13, wherein said sensor response is calculated using the
2 equation $A_R = A_{\lambda 1} / A_{\lambda 2}$, where A_R is said sensor response, $A_{\lambda 1}$ is absorbance at $\lambda 1$ and $A_{\lambda 2}$ is
3 absorbance at $\lambda 2$ and, wherein $A_{\lambda 1}$ and $A_{\lambda 2}$ are determined by

$$A_{\lambda} = -\log \frac{I_{\lambda}}{I_{\lambda 0}}$$

1 20. The method of claim 13, wherein said reagent-based optical chemical sensor is
2 a Submersible Autonomous Moored Instrument for CO₂.

1 21. The method of claim 20, wherein said analyte-selective reagent is bromothymol
2 blue.

1 22. The method of claim 20, wherein said Submersible Autonomous Moored
2 Instrument for CO₂ comprises a spectrograph filter.

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1 23. The method of claim 20, wherein said Submersible Autonomous Moored
2 Instrument for CO₂ comprises a GaP photodiode.

1 24. The method of claim 20, wherein said sensor response is calculated using the
2 equation $A_R = A_{\lambda 1} / A_{\lambda 2}$, where A_R is said sensor response, $A_{\lambda 1}$ is absorbance at $\lambda 1$ and $A_{\lambda 2}$ is
3 absorbance at $\lambda 2$ and wherein $A_{\lambda 1}$ and $A_{\lambda 2}$ are determined by

$$A_{\lambda} = -\log \frac{I_{\lambda}}{I_{\lambda 0}}$$

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